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(54) METHOD AND APPARATUS FOR WRAPPING WEB MARGINAL EDGE WITH EXTRUDED THERMOPLASTIC MATERIAL

(71) We, AMERICAN CAN COMPANY, a corporation organised and existing under the laws of the State of New Jersey, United States of America, of American Lane, Greenwich, Connecticut 06830, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method for wrapping the edge of a moving web with a thermoplastic adhesive strip. This invention also relates to apparatus for applying a ribbon of thermoplastic adhesive material to a raw edge of a moving web.

In the art of can or container body making, it is well known that the exposed raw edge of an unprotected underlap side seam in a longitudinally lapped tubular body is subject to attack by food or other contained products, or conversely, the body stock material may contaminate the contents or give the foodstuffs an undesirable taste. For example, canned soft drinks contain carbonated water which is mildly acidic. When metallic cans or containers including a metallic laminate component are employed to package the soft drink, an exposed and uncoated internal raw edge presents an unprotected area which may react chemically with the acid, giving the soft drink an undesirable taste.

In like manner fiberboard can bodies have raw edge side seams which if left unprotected are subject to wicking', or undesired absorption of liquids. Wicking in fiber can side seams is undesirable since it can form a conduit to the exterior of a can body causing it to leak, among other disadvantages.

Efforts to protect underlap raw edges have taken many forms, such as spraying coating material into a formed can body and along the underlap seam area thereof, or spraying the side edge of container stock with an adhesive prior to forming the stock into a can body, or wrapping the ultimate side seam edge area with a strip of adhesive before forming the container body.

Those techniques requiring internal spraying of the container to protect the exposed underlap edge, as well as spraying or coating a running web edge with melted or liquefied material such as in Battersby et al U.S. Patent Specification No. 3,318,977, require equipment to control the liquid material and to achieve uniform application, which equipment is necessarily moderately complex and inhibits rapid edge protection in relatively high speed body making equipment.

On the other hand, techniques involving wrapping or folding an adhesive ribbon or strip around the edge of running body stock has proven to be an effective method of reliably and uniformly protecting the raw edge. One such technique is shown in our copending Patent Application No. 36941/71 (Serial No. 1,353,077). In that application an extruded or preformed thermoplastic tape is positioned to overhang one edge of a running web container body stock. The tape is wrapped around the raw edge with the aid of differential stress as the can stock is conveyed through a zig-zag path.

The present invention provides a method for wrapping the edge of a moving web with a thermoplastic adhesive strip comprising the steps of:

extruding a ribbon of thermoplastic material onto and along the edge of a moving web therebeneath to dispose a portion of said ribbon in overhang relation to the web edge,

directing flow of heated gas at said ribbon overhang portion to maintain the same in softened condition and wrap it round the edge of the web to engage the under surface thereof, and

pressing said wrapped ribbon smoothly and tightly against said web.

The invention also provides apparatus for applying a ribbon of thermoplastic adhesive material to a raw edge of a moving web, which apparatus comprises:

means for feeding a web of stock material with an edge area thereof continuously accessible,

an extruder head positioned above said web adjacent said edge area thereof for extruding a flat ribbon of thermoplastic adhesive,

means for laying said ribbon onto said web with a portion of said ribbon disposed in overhang relation to the web edge,

means for directing hot gas against said overhang ribbon portion to maintain the same in softened condition and force it around the web edge into engagement with the underside of the web, and

means for pressing said wrapped ribbon against opposing faces of the web.

Preferably, the method of the invention includes the step of preheating said web prior to laydown of said thermoplastic ribbon to enhance bonding of the ribbon to the web. The method may also include the step of initially pressing the thermoplastic ribbon onto said web at the point of laydown.

Preferably, said hot gas flow is initially directed at said ribbon overhang portion from a position above the web and is thereafter directed at said overhang portion from a position below the web thereby to insure progressive enwrapment of the web edge. The stream of heated gas may be directed laterally toward said web edge and said ribbon overhang portion at a position intermediate the above-web and below-web gas directing steps, thereby to insure that the ribbon is in continuous contact with the web around the edge thereof.

In the apparatus of the invention, the ribbon-applying means may comprise a presser roll disposed adjacent said web and in proximity to said extruder head to receive the extruded ribbon thereon. The apparatus may further include means disposed upstream from said extruder for preheating said web.

The hot gas means may include a plurality of nozzles directed toward said web edge. Preferably, the nozzles include an upstream nozzle disposed above said web so as to direct the gas flow therefrom downwardly toward said ribbon overhang portion, and a downstream nozzle disposed below said web for directing the hot gas upwardly toward the ribbon overhang portion, thereby to wrap the ribbon progressively about the web edge area.

A thermoplastic edge-wrapping ribbon of thermoplastic material may be extruded and directed by an applying wheel to lay along and overhang the marginal edge of the moving web of can body or other metal stock of fibrous web, which stock or web may be preheated to enhance reception thereof, followed by a post heater for maintaining the ribbon adhesive in softened condition as it is folded under gas pressure over the overhang portion around the raw edge. The thermoplastic ribbon may act to provide the adhesive bonding means for the container lap seam as well as to protect the web or container stock edge.

The invention will now be described by way of example with reference to the accompanying drawing, in which:

Figure 1 is a diagrammatic overall view of the edge wrapping apparatus of the present invention;

Figure 2 is an enlarged view taken on the line 2—2 of Figure 1;

Figures 3A, 3B and 3C illustrate successive steps in folding the extruded tape about the stock edge; and

Figure 4 is a fragmentary diagrammatic view showing the wrapped underlap edge as it appears in a tubular container body.

Referring to Figure 1, a web 10 of metallic or other container body stock material is advanced from a supply such as roll 12 past preheater 14 where the web 10 is heated along one marginal side edge area E. Preheating of edge E insures reception of the subsequently extruded ribbon and affords a more adherent bond thereof to the web. Downstream of preheater 14, an extruder head 16 is disposed above the running stock web so as to extrude a flat thermoplastic ribbon 20 theretoward and onto applicator wheel 18 disposed adjacent the web and in proximity to the extruder 16.

Applicator wheel 18 is mounted and geared to match the speed of the web, and is spring biased to press the ribbon against and into adhering contact with the web. The wheel 18 is so disposed in relation to the moving web as to lay down the adhesive ribbon 20 with a portion thereof overhanging edge area E of web 10, as seen in Figure 2. The amount of overhang should be sufficient to completely wrap side edge E and adhere to the under surface of web 10. In practice, with small container stock, the overhang may be on the order of $^{3}/_{64}$", for example. A detecting and control system, not shown, such as photocell means, may be employed to maintain proper running alignment of the ribbon 20 on the web by means well known in the art.

From the applicator or laydown wheel 18, the web carrying ribbon 20 is conveyed past a series of hot air or gas nozzles 22, 24, 26 suitably connected to a hot gas supply 28.

As diagrammatically shown in Figures 3A, 3B and 3C, the several hot gas nozzles are successively positioned downstream of

the web so as to progressively deflect the ribbon overhang downwardly over edge area E and thence under the web 10 into engagement with the undersurface thereof. The heat of the gas insures that the extruded thermoplastic ribbon remains sufficiently soft and pliant for deflection, while the pressure of the gas flow from the nozzles constitutes the means for positively forcing the ribbon overhang downwardly and around the edge area E to wrap the same.

While a plurality of separate nozzles are shown in the drawings, it will be apparent that a suitable helically perforated manifold or other flow-shaping means may be employed to effect edge enwrapment in like manner.

Upon leaving the hot air burner and blower zone, the web 10 passes between presser or ironing rolls 30, 30 which firmly press the now-wrapped ribbon into tight adhering contact with web 10, smoothing any wrinkles which may have formed during the wrapping sequence, and aiding in cooling the wrap.

The ribbon of the side seam adhesive may be of plastics material commonly used in container manufacture, such as thermoplastic polyethylene resins, polyvinyl chloride resins and their copolymers, among others that have desirable extrusion, melt, and adhesive characteristics.

The edge-protected container body stock can now be cut into the desired lengths which are thereafter individually formed into lap-seamed tubular can bodies, or the web may be longitudinally tubed and seamed and thereafter severed into tubular can body lengths, as is well known in the art.

It should be understood that the raw edge wrapping apparatus can be associated with presently used container bodymaking equipment without interrupting the normal operation thereof, inasmuch as the interposition of the subject edge-wrapping apparatus of the invention can be economically used in an inline bodymaking operation without interfering with body can forming operation.

When the wrapping apparatus is used to apply a ribbon of thermoplastic adhesive 20 to a fiberboard or other stock 10 which may have combustible characteristics, preheater 12 may not be used, and the hot gas supply 28 is likewise adjusted so as not to scorch the fiberboard stock. Otherwise, the method of applying and wrapping the ribbon 12 is similar to that just described.

The web 10 may be fed by any means well known in the art, or drawn by demand of handling apparatus downstream of the wrapping station. In like manner, the web may be supported through out all or a part of its run on a planar surface or by supportive conveyor means, as requisite, provided only that the web edge be accessible for the wrapping operation.

WHAT WE CLAIM IS:—

1. A method for wrapping the edge of a moving web with a thermoplastic adhesive strip comprising the steps of:

extruding a ribbon of thermoplastic material onto and along the edge of a moving web therebeneath to dispose a portion of said ribbon in overhanging relation to the web edge,

directing a flow of heated gas at said ribbon overhang portion to maintain the same in softened condition and wrap it around the edge of the web to engage the under surface thereof, and

pressing said wrapped ribbon smoothly and tightly against said web.

2. A method according to Claim 1 including the step of preheating said web prior to laydown of said thermoplastic ribbon to enhance bonding of the ribbon to the web.

3. A method according to Claim 1 or Claim 2 including the step of initially pressing the thermoplastic ribbon onto said web at the point of laydown.

4. A method according to any one of the preceding claims wherein said hot gas flow is initially directed at said ribbon overhang portion from a position above the web and is thereafter directed at said overhang portion from a position below the web thereby to ensure progressive enwrapment of the web edge.

5. A method according to Claim 4 including directing a stream of heated gas laterally toward said web edge and said ribbon overhang portion at a position intermediate the above-web and below-web gas directing steps, thereby to insure that the ribbon is in continuous contact with the web around the edge thereof.

6. Apparatus for applying a ribbon of thermoplastic adhesive material to a raw edge of a moving web, which apparatus comprises:

means for feeding a web of stock material with an edge area thereof continuously accessible,

an extruder head positioned above said web adjacent said edge area thereof for extruding a flat ribbon of thermoplastic adhesive,

means for laying said ribbon onto said web with a portion of said ribbon disposed in overhang relation to the web edge,

means for directing hot gas against said overhang ribbon portion to maintain the same in softened condition and force it around the web edge and into engagement with the underside of the web, and

means for pressing said wrapped ribbon against opposing faces of the web.

7. Apparatus according to Claim 6 wherein said ribbon-applying means comprises a presser roll disposed adjacent said web and in proximity to said extruder head to receive the extruded ribbon thereon.

8. Apparatus according to claim 6 or claim 7 further including means disposed uptseram from said extruder for preheating said web.

9. Apparatus according to any one of Claims 6—8 wherein said hot gas means includes a plurality of nozzles directed toward said web edge.

10. Apparatus according to Claim 9 wherien said nozzles include an upstream nozzle disposed above said web so as to direct the gas flow therefrom downwardly toward said ribbon overhang portion, and a downstream nozzle disposed below said web for directing the hot gas upwardly toward the ribbon overhang portion, thereby to wrap the ribbon progressively about the web edge area.

11. A method for wrapping the edge of a miving web with a thermoplastic adhesive strip, substantially as herein described with reference to the accompanying drawings.

12. Apparatus for applying a ribbon of thermoplastic adhesive material to a raw edge of a moving web, substantially as herein described with reference to the accompanying drawing.

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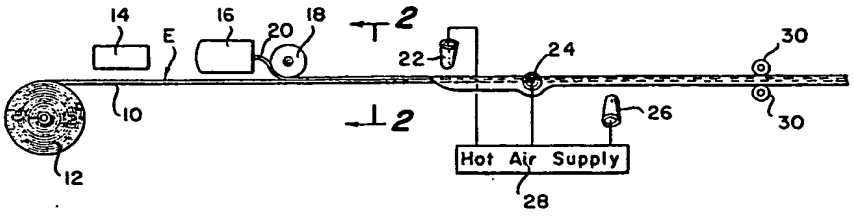

Fig. 1

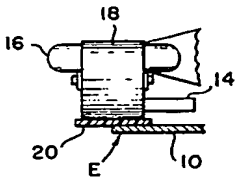

Fig. 2

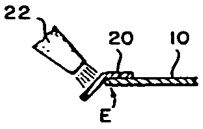

Fig. 3a

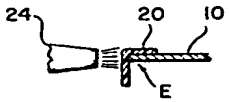

Fig. 3b

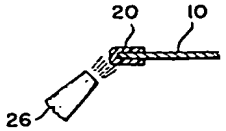

Fig. 3c

Fig. 4